

IN THE CLAIMS

1. - 40. (Previously Canceled)

41. (Amended) A circuit on a single substrate, comprising:

a logic device, wherein the logic device further includes a transistor with a [dielectric layer] gate dielectric having a first thickness including a top layer which exhibits a high resistance to oxidation at high temperatures; and

a memory device coupled to the logic device, wherein the memory device further includes a transistor with a [dielectric layer] gate dielectric having a second thickness greater than the [dielectric layer] gate dielectric of the first thickness but less than 12 nanometers, wherein the [dielectric layer] gate dielectric of the second thickness is formed entirely of silicon dioxide (SiO₂).

42. (Amended) The circuit of claim 41, wherein the [dielectric layer] gate dielectric having a first thickness includes a [dielectric layer] gate dielectric of less than 7 nanometers, wherein the [dielectric layer] gate dielectric has a bottom layer of silicon dioxide (SiO₂), and wherein the top layer is silicon nitride (Si₃N₄).

43. (Amended) The circuit of claim 41, wherein the logic device transistor and the memory device transistor both include a gate formed from boron doped polysilicon, and wherein the top layer of the [dielectric layer] gate dielectric having a first thickness exhibits a strong resistance to boron penetration at high temperatures.

44. (Amended) The circuit of claim 43, wherein the top layer of the [dielectric layer] gate dielectric having a first thickness exhibits a strong resistance to boron penetration at temperatures above approximately 300 degrees Celsius.

45. (Amended) The circuit of claim 41, wherein the [dielectric layer] gate dielectric of a first thickness having a top layer which exhibits a high resistance to oxidation at high temperatures

includes a top layer of silicon nitride (Si_3N_4) which comprises approximately a third of the first thickness of the [dielectric layer] gate dielectric.

46. (Amended) The circuit of claim 45, wherein the top layer of the [dielectric layer] gate dielectric of the first thickness has a thickness of less than 2 nanometers.

47. (Amended) A system on a chip, comprising:

a logic device, wherein the logic device further includes a transistor with a [dielectric layer] gate dielectric having a first thickness of less than 7 nanometers including a top layer which exhibits a high resistance to oxidation at high temperatures; and

a memory device coupled to the logic device, wherein the memory device further includes a transistor with a [dielectric layer] gate dielectric having a second thickness greater than the [dielectric layer] gate dielectric of the first thickness but less than 12 nanometers.

48. (Amended) The system of claim 47, wherein the [dielectric layer] gate dielectric having a first thickness includes a dielectric layer having a bottom layer of silicon dioxide (SiO_2), and wherein the top layer is silicon nitride (Si_3N_4).

49. (Amended) The system of claim 47, wherein the logic device transistor and the memory device transistor both include a gate formed from boron doped polysilicon, and wherein the top layer of the [dielectric layer] gate dielectric having a first thickness exhibits a strong resistance to boron penetration at high temperatures.

50. (Amended) The system of claim 49, wherein the top layer of the [dielectric layer] gate dielectric having a first thickness exhibits a strong resistance to boron penetration at temperatures above approximately 300 degrees Celsius.

51. (Amended) The system of claim 49, wherein the top layer of the [dielectric layer] gate dielectric having a first thickness exhibits a strong resistance to boron penetration at temperatures above approximately 800 degrees Celsius.

52. (Amended) The system of claim 47, wherein the [dielectric layer] gate dielectric of a first thickness having a top layer which exhibits a high resistance to oxidation at high temperatures includes a top layer of silicon nitride (Si₃N₄) which comprises approximately a third of the first thickness of the [dielectric layer] gate dielectric.
53. (Amended) The circuit of claim 52, wherein the top layer of the [dielectric layer] gate dielectric of the first thickness has a thickness of less than 2 nanometers.
54. (Amended) The system of claim 52, wherein the [dielectric layer] gate dielectric of the second thickness is formed entirely of silicon dioxide (SiO₂).
55. (Amended) A circuit on a single substrate, comprising:
a logic device, wherein the logic device includes a transistor with a [dielectric layer] first gate dielectric of a first thickness including:
a first dielectric layer of a first thickness less than 5 nanometers;
a top layer which exhibits a high resistance to oxidation at high temperatures; and
a memory device coupled to the logic device, wherein the memory device further includes a transistor with a second [dielectric layer] gate dielectric having a second thickness greater than the [dielectric layer] first gate dielectric of the first thickness.
56. (Previously Added) The circuit of claim 55, wherein the first dielectric layer and the top layer together have a thickness of less than 7 nanometers.
57. (Previously Added) The circuit of claim 55, wherein first dielectric layer of a first thickness includes silicon dioxide (SiO₂) and the top layer includes silicon nitride (Si₃N₄).
58. (Amended) The circuit of claim 55, wherein the second [dielectric layer] gate dielectric of a second thickness includes a [dielectric layer] gate dielectric formed entirely of silicon dioxide (SiO₂).

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59. (Amended) The circuit of claim 55, wherein the second [dielectric layer] gate dielectric of a second thickness includes a [dielectric layer] gate dielectric having a thickness of less than 12 nanometers.

60. (Amended) The circuit of claim 55, wherein the top layer includes a top layer of silicon nitride (Si₃N₄) which comprises approximately a third of the first thickness of the first [dielectric layer] gate dielectric.

61. (Previously Added) The circuit of claim 55, wherein the top layer exhibits a high resistance to boron penetration at high temperatures.

62. (Amended) A circuit on a single substrate, comprising:
a logic device, wherein the logic device includes a transistor with a [dielectric layer] first gate dielectric of a first thickness including:

a first dielectric layer of a first thickness less than 5 nanometers;

a top layer which exhibits a high resistance to boron penetration at high temperatures; and

a memory device coupled to the logic device, wherein the memory device further includes a transistor with a second [dielectric layer] gate dielectric having a second thickness greater than the [dielectric layer] first gate dielectric of the first thickness.

63. (Previously Added) The circuit of claim 62, wherein the top layer and the first dielectric layer together have a thickness of less than 7 nanometers (nm).

64. (Amended) The circuit of claim 62, wherein the first dielectric layer of a first thickness includes silicon dioxide (SiO₂) and the top layer includes silicon nitride (Si₃N₄).

65. (Amended) The circuit of claim 62, wherein the second [dielectric layer] gate dielectric of a second thickness includes a [dielectric layer] gate dielectric formed entirely of silicon dioxide (SiO₂).

66. (Amended) The circuit of claim 62, wherein the second [dielectric layer] gate dielectric of a second thickness includes a [dielectric layer] gate dielectric having a thickness of less than 12 nanometers.

67. (Previously Added) A circuit on a single substrate, comprising:
a logic device, wherein the logic device includes a transistor with a dielectric layer including:

a first dielectric layer of a first thickness less than 5 nanometers;

a silicon nitride (Si₃N₄) top layer which exhibits a high resistance to oxidation at high temperatures; and

a memory device coupled to the logic device, wherein the memory device further includes a transistor with a second dielectric layer having a second thickness greater than the dielectric layer of the first thickness.

68. (Previously Added) The circuit of claim 67, wherein the first dielectric layer and the top layer together have a thickness of less than 7 nanometers (nm).

69. (Previously Added) The circuit of claim 67, wherein the second dielectric layer of a second thickness includes a dielectric layer formed entirely of silicon dioxide (SiO₂).

70. (Previously Added) The circuit of claim 67, wherein the second dielectric layer of a second thickness includes a dielectric layer having a thickness of less than 12 nanometers.

71. (Previously Added) The circuit of claim 67, wherein the silicon nitride (Si₃N₄) top layer includes a silicon nitride (Si₃N₄) top layer with a thickness of approximately a third of the first thickness of the first dielectric layer.

72. (Previously Added) The circuit of claim 67, wherein the top layer exhibits a high resistance to boron penetration at high temperatures.

73. (Previously Added) A circuit on a single substrate, comprising:
a logic device, wherein the logic device includes a transistor with a dielectric layer including:

a first dielectric layer of a first thickness less than 5 nanometers;

a silicon nitride (Si₃N₄) top layer of approximately a third of the first thickness which exhibits a high resistance to oxidation at high temperatures; and

a memory device coupled to the logic device, wherein the memory device further includes a transistor with a second dielectric layer having a second thickness of less than 12 nanometers (nm).

74. (Previously Added) The structure of claim 73, wherein the top layer exhibits a high resistance to boron penetration at high temperatures.

75. (Previously Added) The structure of claim 73, wherein the first dielectric layer and the top layer together have a thickness of less than 7 nanometers (nm).

76. (Previously Added) The structure of claim 73, wherein the second dielectric layer of a second thickness includes a dielectric layer formed entirely of silicon dioxide (SiO₂).

77. (Previously Added) A circuit on a single substrate formed by the method comprising:
forming a logic device including a first transistor and a memory device including a second transistor on a single substrate;

forming a pair of gate oxides on the first transistor and the second transistor to a first thickness of less than 5 nanometers (nm) by krypton plasma generated atomic oxygen at approximately 400 degrees Celsius;

AMENDMENT AND RESPONSE UNDER 37 CFR § 1.116 – EXPEDITED PROCEDURE

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forming a thin dielectric layer on one of the pair of gate oxides, wherein the thin dielectric layer exhibits resistance to oxidation at high temperatures; and
forming the other of the pair of gate oxides to a second thickness.